CLAIMS

1. Optical amplifier device (1) comprising:

optical input (10);

a first nonlinear optical fiber (12), having a first set of fiber property parameters, comprising a first zero-dispersion wavelength (λ_0);

a second nonlinear optical fiber (12), having a second set of fiber property parameters, comprising a second zero-dispersion wavelength (λ_0);

optical demultiplexer (14) connecting said optical input (10) and said first and second nonlinear optical fibers (12), directing optical signals within a first wavelength interval ($\Delta\lambda$) to said first nonlinear optical fiber (12) and directing optical signals within a second wavelength interval ($\Delta\lambda$) to said second nonlinear optical fiber (12);

at least one optical pump (18), pumping said first and second nonlinear optical fibers (12) with radiation having a pump wavelength (λ_P) in the vicinity of respective said zero-dispersion wavelength (λ_0);

said first nonlinear optical fiber (12) giving a high parametric amplification in said first wavelength interval ($\Delta\lambda$) and said second nonlinear optical fiber (12) giving a high parametric amplification in said second wavelength interval ($\Delta\lambda$);

optical output (20); and

optical multiplexer (16) connecting said first and second nonlinear optical fibers (12) and said optical output (20), merging optical signals from said first and second nonlinear optical fibers (12) into said optical output (20);

a pump wavelength (λ_P) provided to said first nonlinear optical fiber being positioned outside said first wavelength interval and a pump wavelength (λ_P) provided to said second nonlinear optical fiber being positioned outside said second wavelength interval.

2. Optical amplifier device according to claim 1, **characterized in that** said first wavelength interval being positioned at a high-gain portion of a gain distribution of said parametric amplification in said first nonlinear optical fiber, and said second wavelength interval being positioned at a high-gain portion of a gain distribution of said parametric amplification in said second nonlinear optical fiber.

3. Optical amplifier device according to claim 1 or 2, **characterized in that** said first set of fiber property parameters is different from said second set of fiber property parameters.

4. Optical amplifier device according to any of the claims 1 to 3, **characterized in that** said first nonlinear optical fiber and said second nonlinear optical fiber are pumped with one common optical pump, whereby said first and second nonlinear optical fibers are pumped with the same pump wavelength (λ_P).

5. Optical amplifier device according to claim 4, **characterized in that** said first nonlinear optical fiber has a second order dispersion coefficient β_2 different from the second order dispersion coefficient β_2 of said second nonlinear optical fiber.

6. Optical amplifier device according to any of the claims 1 to 3, **characterized in that** said first nonlinear optical fiber is pumped with a first optical pump and said second nonlinear optical fiber is pumped with a second optical pump.

7. Optical amplifier device according to claim 6, **characterized in that** said first optical pump has a pump frequency different from the pump frequency of said second optical pump.

8. Optical amplifier device according to claim 7, **characterized in that** said first and second nonlinear optical fibers substantially have the same second order dispersion coefficients β_2.

9. Optical amplifier device according to any of the claims 3 to 8, **characterized in that** said first nonlinear optical fiber has a zero dispersion wavelength different from the zero dispersion wavelength of said second nonlinear optical fiber.

10. Optical amplifier device according to claim 1, **characterized in that** said first set of fiber property parameters is substantially the same as said second set of fiber property parameters.

11. Optical amplifier device according to any of the claims 1 to 10, **characterized in that** said first wavelength interval covers at least a part of a signal band of said parametric amplification of said first nonlinear optical fiber.

12. Optical amplifier device according to any of the claims 1 to 11, **characterized in that** said second wavelength interval covers at least a part of an idler band of said parametric amplification of said second nonlinear optical fiber.

13. Optical amplifier device according to any of the claims 1 to 12, **characterized by** at least one further optical fiber connected between said optical demultiplexer (14) and said optical multiplexer (16), whereby each optical fiber

receives optical signals within a respective wavelength interval from said optical demultiplexer (14).

14. Optical amplifier device according to claim 13, **characterized in that** at least one of said at least one further optical fiber is provided with a non-parametric amplification.

15. Optical amplifier device according to any of the claims 1 to 14, **characterized in that** at least one of said nonlinear optical fibers has a fourth order dispersion coefficient β_4, adapted to give a flat gain band within the associated wavelength interval.

16. Optical amplifier device according to any of the claims 1 to 15, **characterized in that** said first and second nonlinear optical fibers have non-linearity coefficients γ exceeding 10 $km^{-1}W^{-1}$.

17. Fiber-optical communication system, comprising an optical amplifier device according to any of the claims 1 to 16.

18. Fiber-optical communication system according to claim 17, **characterized in that** said fiber optical system is arranged to use wavelength division multiplexing.

19. Fiber-optical communication system according to claim 18, **characterized in that** said fiber optical system is arranged to use dense wavelength division multiplexing.

20. Method for optical amplifying, comprising the steps of:

directing optical signals within a first wavelength interval to a first nonlinear optical fiber;

directing optical signals within a second wavelength interval to a second nonlinear optical fiber;

performing first parametric amplification in said first nonlinear optical fiber, by pumping with radiation of a first pump wavelength;

performing second parametric amplification in said second nonlinear optical fiber, by pumping with radiation of a second pump wavelength;

said first pump wavelength being positioned outside said first wavelength interval and said second pump wavelength being positioned outside said second wavelength interval; and

multiplexing amplified signals from said first and second nonlinear optical fibers.

21. Method according to claim 20, **characterized in that** said first wavelength interval being positioned at a high-gain portion of a gain distribution of said first parametric amplification and said second wavelength interval being positioned at a high-gain portion of a gain distribution of said second parametric amplification.

22. Method according to claim 20 or 21, **characterized by** the step of pumping said first nonlinear optical fiber and said second nonlinear optical fiber with optical signals having substantially the same wavelength.

23. Method according to claim 22, **characterized by** the step of pumping said first nonlinear optical fiber with a first optical signal and pumping said first nonlinear optical fiber with a second optical signal having a wavelength different from the wavelength of said first optical signal.

24. Method according to any of the claims 20 to 23, **characterized in that** said first wavelength interval covers at least a part of a signal band of said parametric amplification of said first nonlinear optical fiber.

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25. Method according to any of the claims 20 to 24, **characterized in that** said second wavelength interval covers at least a part of an idler band of said parametric amplification of said second nonlinear optical fiber.